

1 Key Touch PAD Detector IC

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Outline

TTP118-DB8 is a touch pad detector IC which offers 1 touch key. Stable sensing method can cover diversity conditions. The touching detection IC is designed for replacing traditional direct button key with diverse pad size. Lower power consumption and wide operating voltage are the contact key features for DC or AC application.

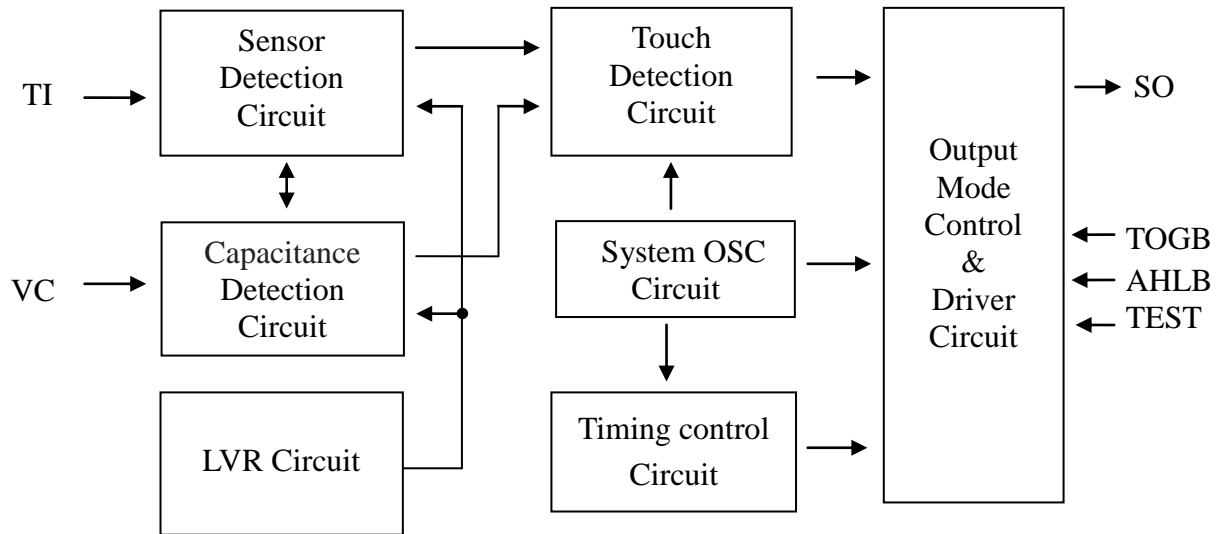
Characteristic

- Operating voltage 2.4~5.5V
- Lower Power mode operating Current (no load)
 - @VDD=3.3V, typical 4uA, maximum 8uA.
 - @VDD=5.0V, typical 8uA, maximum 16uA.
- Built-in power on initial(POR) and low voltage reset (LVR) function
- The response time(minimum) @VDD=5.0V
 - @ Detective mode 48ms.
 - @ Lower power mode 132ms.
- Touch PAD Sensitive can adjust by external capacitance (C_{S0} :1~47nF)
- Provides direct output or toggle output select, CMOS high-level active or low-level active output mode, selectable via TOGB/AHLB pin.
- Auto calibration function
 - The reference value is refreshed every 62.5 milliseconds within 4.0 seconds after power-on.
 - If the touch button is not touched after 4.0 seconds of power-on, the recalibration cycle switching time is about 1.0 second.

Applications

- Wide consumer products
- Button key replacement

Block diagram



Pin Description

Pin NO	Pin Name	Type	Pin Description
1	TEST	I	TEST input: open => TEST mode ; VSS=> normal mode
2	VC	I/O	Capacitance detection
3	VDD	P	Positive power supply
4	VSS	P	Negative power supply, ground
5	TI	I/O	Input sensor port
6	TOGB	I-ZL	Output mode selection: open =>Direct output ; VSS => Toggle output
7	SO	O	CMOS output pin
8	AHLB	I-ZL	Active high or low selection: open=> Active low ; VSS=> Active high

Note:

I_ZL: A pull-down resistor when powering up, turn to built-in pull-up resistor after reading the status. (Leakage will be generated when connect to VDD)

Pin Type

- I CMOS input only
- O CMOS out
- I/O CMOS input/output
- P Power/Grand
- I-ZH CMOS input and pull-high resistor
- I-ZL CMOS input and pull-low resistor

Electrical Characteristics

- **Absolute maximum ratings**

Parameter	Symbol	Conditions	Rating	Unit
Operating Temperature	TOP	—	-40~+85	°C
Storage Temperature	TSTG	—	-50~+125	°C
Supply Voltage	VDD	Ta=25°C	VSS-0.3~VSS+5.5	V
Input Voltage	VIN	Ta=25°C	VSS-0.3~VDD+0.3	V
Human Body Mode	ESD	—	≥4	KV

Note : VSS symbolizes for system ground

- **DC / AC characteristics : (Test condition at room temperature = 25 °C)**

Parameter	Symbol	Test Condition	Min	Typ	Max	Unit
Operating Voltage	VDD		2.4	3.3	5.5	V
Lower Power mode Operating current	I _{OPL}	VDD=3.3V, VC=10nF, no load	-	4.0	8.0	uA
		VDD=5.0V, VC=10nF, no load	-	8.0	16	uA
Detective mode Operating current	I _{OP}	VDD=3.3V, VC=10nF, no load	-	130	-	uA
		VDD=5.0V, VC=10nF, no load	-	210	-	uA
System oscillator	F _{OSC}	VDD = 3.3V	-	17K	-	Hz
		VDD = 5.0V	-	16K	-	Hz
Input ports	V _{IL}	Input low voltage	-	-	0.2	VDD
	V _{IH}	Input high voltage	0.8	-	1.0	VDD
SO Output port Sink Current	I _{OL}	VDD=3.3V, VOL=0.5V	-	8	-	mA
		VDD=5.0V, VOL=0.5V	-	12	-	mA
SO Output port Source Current	I _{OH}	VDD=3.3V, VOH=2.8V	-	-3.5	-	mA
		VDD=5.0V, VOH=4.5V	-	-5.0	-	mA
SO Output response time	T _R	VDD=3.3V, Lower power mode	-	120	-	ms
		VDD=3.3V, Detective mode	-	45	-	ms
		VDD=5.0V, Lower power mode	-	132	-	ms
		VDD=5.0V, Detective mode	-	48	-	ms

Function Description

I . Power-On and Reset instruction

The reference value is refreshed every 62.5 milliseconds within 4.0 seconds after power-on. If the touch button is not touched after 4.0 seconds of power-on, the recalibration cycle switching time is about 1.0 second. The output port returns to its initial state when rest.

II . Sensitivity adjustment

The total loading of electrode size and capacitance of connecting line on PCB can affect the sensitivity. C_{S0} the sensitivity adjustment must according to the practical application on PCB. The TTP118 offers some methods for adjusting the sensitivity outside.

1. By the electrode size

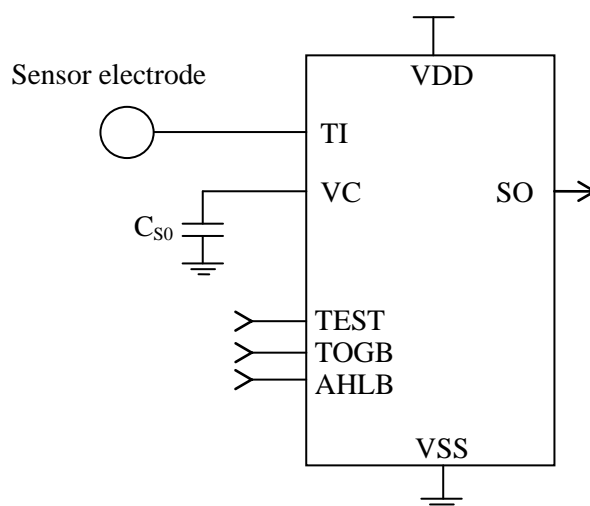
Under other conditions are fixed. Using a larger electrode size can increase sensitivity. Otherwise it can decrease sensitivity. But the electrode size must use in the effective scope.

2. By the panel thickness

Under other conditions are fixed. Using a thinner panel can increase sensitivity. Otherwise it can decrease sensitivity. But the panel thickness must be below the maximum value.

3. By the value of C_{S0} please see the down figure

Under other conditions are fixed. PAD VC to VSS capacitor C_{S0} can adjust sensitivity, when adding the value of C_{S0} will increase sensitivity in the useful range $1nF \leq C_{S0} \leq 47nF$.



III. Output mode (TOGB , AHLB pin option)

AHLB pin: SO output active high or active low selection

TOGB pin: SO direct or toggle output selection

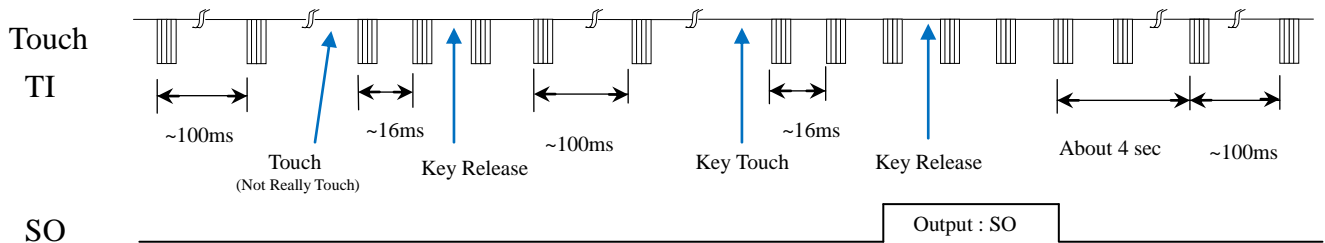
TOGB	AHLB	SO option features
open	open	Direct output, CMOS active low
open	VSS	Direct output, CMOS active high
VSS	open	Toggle output, power on state = 1
VSS	VSS	Toggle output, power on state = 0

Note: VSS: connect to VSS. open: floating

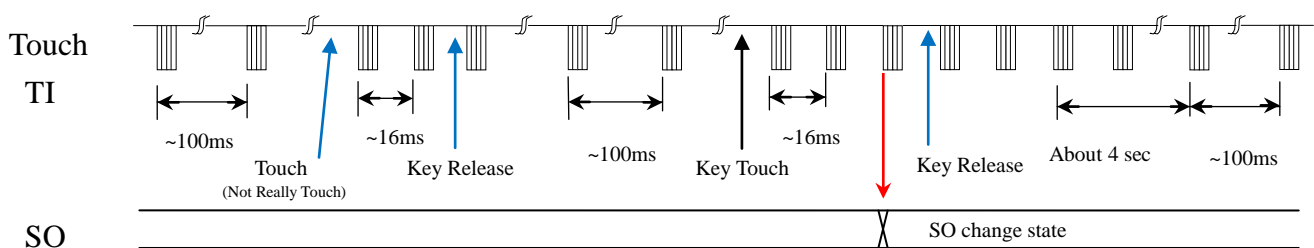
IV. Lower Power Mode Touch and SO output

IC will save power in lower power mode, it will be saving power. When detecting key touch, it will switch to detective mode. Until the key touch is released and will keep a time about 4 sec. Then it returns to standby mode. At VDD=5V, the lower power mode SO output response time about 132ms, the detective mode SO output response time about 48 milliseconds.

1. Direct output mode timing:



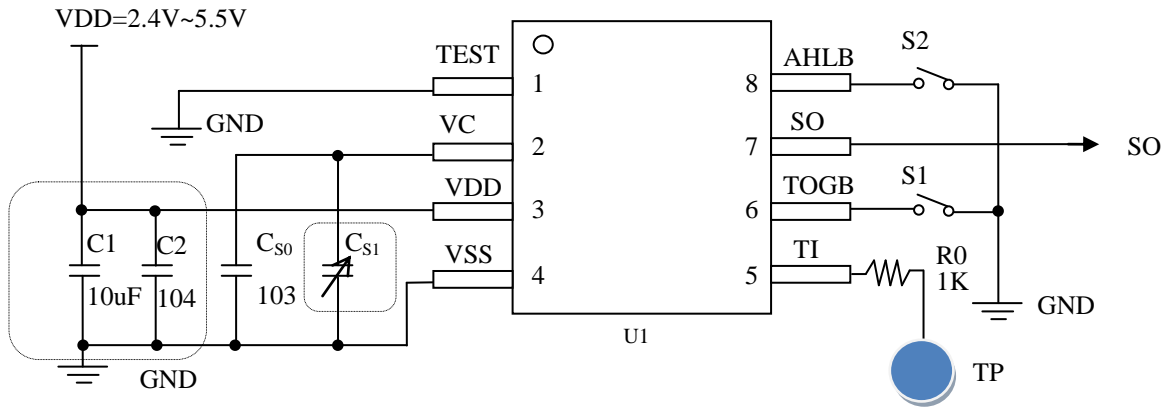
2. Toggle output mode timing:



Application circuit

Reference only

I . Circuit



Note: C1, C2, Cs0, Cs1 depending on the application.

II . Function table

Output mode selection

TOGB	AHLB	SO option features
open	open	Direct output, CMOS active low
open	VSS	Direct output, CMOS active high
VSS	open	Toggle output, power on state = 1
VSS	VSS	Toggle output, power on state = 0

Note: VSS: connect VSS. open: floating

III. PCB layout note

1. On PCB, the length of lines from touch pad to IC pin shorter is better.
And the lines do not parallel and cross with other lines.
2. The power supply must be stable. If the supply voltage drift or shift quickly, maybe causing sensitivity anomalies or false detections.
3. The material of panel covering on the PCB can not include the metal or the electric element. The paints on the surfaces are the same.
4. The C1, C2 capacitor must be used between VDD and VSS; and should be routed with very short tracks to the device's VDD and VSS pins.
5. The capacitance C_{S0} can be used to adjust the sensitivity. The value of C_{S0} use larger, then the sensitivity will be better. The sensitivity adjustment must according to the practical application on PCB. The range of C_{S0} value are 1nF~47nF.
6. The sensitivity adjustment capacitors (C_{S0} , C_{S1}) must use smaller temperature coefficient and more stable capacitors. Such are X7R, NPO for example. So for touch application, recommend to use NPO capacitor, for reducing that the temperature varies to affect sensitivity.
7. Medium type for adjustment capacitors (C_{S0})

IV. C_{S0} value table

Medium Types	C_{S0} Capacitance (Reference)
Acrylic sheet \leq 3mm	6.8nF/25V
3mm \leq Acrylic sheet \leq 6mm	10nF/25V
Acrylic sheet \leq 6-10mm	22nF/25V

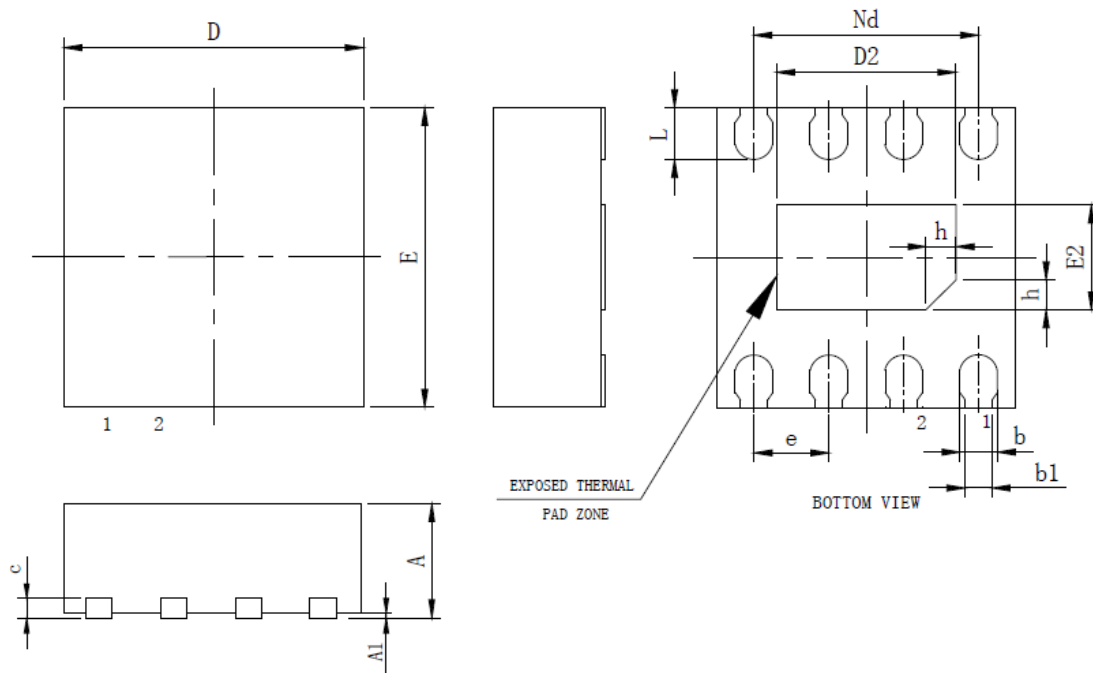
V. BOM table

元件標示	元件名稱	元件參數
C_{S0}	capacitor	Reference C_{S0} value Table
C_{S1}	capacitor	0pF*
C1	Electrolytic capacitor	10uF/25V*
C2	Ceramic capacitor	104*
R0	Carbon film resister	1K Ω *
S1,S2	switch	Single pole single throw switch

Note: * Resistance and Capacitance value depends on the application.

Package outline

Package Type: DFN-8



Symbol Parameter (Unit : mm)												
A			Al			b			b1		c	
Min	Nom	Max	Min	Nom	Max	Min	Nom	Max	Typ	Min	Nom	Max
0.70	0.75	0.80		0.02	0.05	0.18	0.25	0.30	0.18 REF	0.18	0.20	0.25

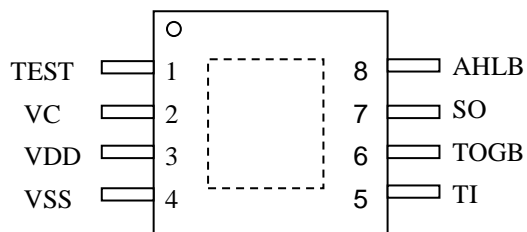
Symbol Parameter (Unit : mm)												
D			D2			e		Nd		E		
Min	Nom	Max	Min	Nom	Max	Typ	Typ	Min	Nom	Max		
1.90	2.00	2.10	1.10	1.20	1.30	0.5 BSC		1.50 BSC	1.90	2.00	2.10	

Symbol Parameter (Unit : mm)								
E2			L			h		
Min	Nom	Max	Min	Nom	Max	Min	Nom	Max
0.60	0.70	0.80	0.30	0.35	0.40	0.15	0.20	0.25

Package configuration

TTP118-DB8N

Package type: DFN-8



Ordering Information

TTP118

Package Item	Package Type	Chip Type	Wafer Type
TTP118-DB8N	DFN-8	No support	No support

Revision History:

- 2019/08/29 : Version: 1.0
Initial version.
- 2020/12/28 : Version: 2.0
Modify format.